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RESPONSE OF DIFFERENT WHEAT (*TRITICUM AESTIVUM* L.) VARIETIES TO GRADED LEVELS OF NITROGEN

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ABSTRACT

The present study entitled, "Response of different wheat (Triticum aestivum L.) Varieties to graded levels of nitrogen" was conducted during the winter season of 2009-10 on sandy clay loam soils of Students' farm, College of Agriculture, Acharya N. G. Ranga Agricultural University, Rajendranagar, Hyderabad. The treatments consisted of three varieties (HP 4080, RAJ 4037 and HI 8682) and four nitrogen levels (0, 60, 120 and 180 kg N ha^{-1}). The experiment was laid out in randomized block design with varieties as first factor and nitrogen levels as second factor with three replications. The findings of experiment are summarized below. The yield attributing characters viz., number of ears per m^2, no of grains per ear, length of ear and 1000-grain weight recorded significantly higher values with RAJ 4037 when compared to other two varieties and among nitrogen levels, 180 kg N ha^{-1} recorded maximum values over all the lower levels of nitrogen. Interaction between varieties and nitrogen levels was found to be non significant for all the yield attributing characters.

KEYWORDS: Triticum Aestivum L, Sandy Clay Loam Soils of Students' Farm

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Original Article

INTRODUCTION

Wheat is the most important and widely cultivated food crop in the world. In India, wheat is the second important cereal crop, first being Rice. In India, wheat occupies an area of 28.15 million hectares with a total production of 758.06 million tonnes with an average productivity of 2,708 kg ha^{-1}. (Source: Ministry of Agriculture, Govt. of India).

In Andhra Pradesh, wheat occupies an area of 10,000 hectares with a total production of 9,000 tonnes with an average productivity of 900 kg ha^{-1}. Wheat is mainly cultivated in the districts of Medak, Adilabad, Nizamabad, Rangareddy and Mahabubnagar. (Source: Directorate of Economics and Statistics) To improve the production of wheat, as in any other crop, introduction of varieties with a high yield potential is essential. Variety contributes more than 50 percent of the increased production. The next important component for increased production is the nutrient availability. Native fertility level of the tropical soils with special reference to nitrogen is invariably insufficient for touching the peak production mark of a variety and hence, the need for supplementing this nutrient is obvious with most varieties.

Productivity of wheat is governed by improved varieties coupled with matching production technology. Suitability of varieties to a particular agro- climate is the most important factor in realizing their yield potential, which is further influenced by their response to application of nutrients, particularly nitrogen. Selection of suitable

genotype is of prime importance as the genetic potential of varieties limits response to nitrogen. Moreover, varieties differ both in yield and nutrient uptake. Hence, it is necessary to find out the correct dose of nitrogen and suitable varieties for maximizing wheat yields in Southern Telangana agro-climatic zone. Therefore, the present study was carried out.

MATERIALS AND METHODS

The experiment was conducted during *rabi* on sandy loam soils at students' farm, College of Agriculture, Rajendranagar, Hyderabad which is geographically situated at $17^0.19^1$ N latitude, 78^028^1 E longitudes and at an altitude of 542.3 m above mean sea level, covered under Southern Telangana agro-climatic zone of Andhra Pradesh. The weekly mean average temperature of 29.7°c minimum temperature 15.7°c. Mean relative humidity ranged from 45 to 82 per cent. The total rain fall received during the crop growth period was 44.8 mm spread in three rainy days. The weekly mean sunshine hours varied from 4.4 to 9.1 with an average of 7.66 hours per day and mean evaporation ranged from 4.8 to 7.9 mm with an average of 6.2 mm per day. The mean wind speed ranged from 1.6 to 5.4 km hr^{-1} with an average of 3.2 km hr^{-1}. During the crop growth period

Plant Height

Height of the individual plant was recorded at 10, 30, 60, 90 DAS and at harvest, from ground level to the tip of the plant. 10 plants in each plot were selected randomly, tagged and plant height was measured. **Leaf area index**: Leaf area index was measured at 10, 30, 60 and 90 DAS with the help of leaf area meter. **Dry matter accumulation**: Plants from half metre row length were removed and washed with water to remove soil particles, shade dried and kept in oven for one day at 60^0C and dry matter was taken at 10, 30, 60, 90 days after sowing and at harvest. **Number of tillers per metre row length:** The number of tillers was counted in a metre row length where initial plant population was counted.

Number of Ears Per m^2

The number of ears was counted from a square metre area randomly at three places in each plot.

Length of the Ear (cm)

Length of ear was recorded randomly from base of the first spikelet to tip of the last spikelet.

Number of Grains per Ear

Grain number of ten individual ears was counted and means value was taken.

1000 Grain Weight (g)

A sample of 1000 grains was drawn from a bulk and weight was taken.

Grain Yield (kg ha^{-1})

The grain weight of each net plot was recorded in kg and subsequently converted into q ha^{-1}. **Straw Yield (kg ha^{-1}):** The straw weight of each net plot was recorded in kg and subsequently converted into q ha^{-1}. The cost of cultivation ha^{-1} was calculated for the individual treatments on the basis of inputs used and prevailing market prices. Gross monetary returns were estimated by multiplying economic yield with prevailing market price of wheat. Net monetary returns were calculated by deducting cost of cultivation from gross monetary returns for each treatment. Benefit-cost (BC) ratio was calculated by using the formula.

Net returns (Rs ha^{-1})

Benefit cost ratio = ----------

Cost of cultivation (Rs ha^{-1})

RESULTS

Plant Height

Plant height was significantly influenced due to different varieties and nitrogen levels at different growth stages of wheat, while their interaction was found to be significant at 60 DAS (Table 1).

At 10 DAS the variety RAJ 4037 recorded more plant height (13.33 cm) compared to other varieties i.e, HP 4080 and HI 8682. At 30, 60, 90 DAS and at harvest the variety HP 4080 and HI 8682 recorded on par and superior plant height over RAJ 403. This variability in the plant height can be attributed to the variation in the genetic constitution of different varieties. The variation in plant height among cultivars has also been reported by Mosalem *et al* (2000).

Plant height increased significantly with increase in nitrogen levels at all the growth stages. Significantly taller plants were produced at all the growth stages with application of 180 kg N ha^{-1}. Nitrogen being the constituent of amino acids, proteins and protoplasts, directly influences plant growth and development through better utilization of photosynthates. These results were in conformity with findings of Sushila, R and Gajendra Giri (2000) and Dileep Kachroo and Ravinder Razdan (2006).

The interaction effect at 60 DAS has shown that the variety HP 4080 attained significantly higher plant height at 180 kg N ha^{-1} and is on par with HI 8682.

Leaf Area Index

Leaf area index of tested wheat varieties increased up to 60 DAS and then decreased. LAI was significantly influenced by varieties and nitrogen levels. The interaction between varieties and nitrogen levels was not found to be significant.

At all growth stages the variety RAJ 4037 recorded the maximum leaf area index compared to HP 4080 and HI 8682 (Figure 4.3). At 10 DAS the variety RAJ 4037 was on par with HI 8682. The difference among the varieties can be attributed to the more number of tillers. LAI increased up to 60DAS and thereafter decreased due to leaf senescence with the approach of maturity. The variation in the LAI among cultivars has also been reported by Pandey *et al* (1999).

Among the nitrogen levels, LAI increased with increase in nitrogen levels from 0 kg N ha^{-1} to 180 kg N ha^{-1} (Table 4.4) (Figure 4.4). Increase in leaf area index with increase in nitrogen level may be the effect of stimulated tiller formation. These results were in conformity with Ezaz Ahmed Warraich *et al* (2002).

Dry Matter Accumulation

Dry matter accumulation was found to be influenced by different varieties and varying nitrogen levels and interaction was found significant at harvest. At 10 DAS variety RAJ 4037 recorded higher dry matter (132.83 kg ha^{-1}) which was on par with HI 8682 (131.00). At 30, 60 and 90 DAS variety RAJ 4037 has recorded significantly higher dry matter over the other two varieties tested. This can be attributed to variability in number of tillers and leaf area which has led to higher accumulation of photosynthates in RAJ 4037. The variation among cultivars has also been reported by Satish

Kumar et al (1998) and Mosalem et al (2000).

With increase in applied nitrogen the crop responded well irrespective of varieties leading to more dry matter accumulation. Due to higher photosynthesis, contributed by higher leaf area resulting in the accumulation of significantly higher dry matter. These results were in conformity with the findings of Satish Kumar *et al*. (1998) and Mosalem *et al.* (2003).

The interaction between the varieties and nitrogen levels was found to be significant at harvest. At harvest variety RAJ 4037 at 180 kg N ha^{-1} produced the maximum dry matter (8286.66 kg ha^{-1}).

Yield parameters: (**Number of tillers per metre row length, number of ears per sq. metre, number of grains per ear, length of ear and 1000 grain weight**).

Yield attributes i.e., Number of tillers per metre row length, number of ears per sq.m, number of grains per ear, length of ear and 1000-grain weight were recorded at the harvest of the crop. The influence of different varieties and nitrogen levels were found significant on these attributes, however interaction was found to be non-significant.

Varieties differed significantly in terms of yield attributes. Number of tillers per metre row length, number of ears per sq.m, number of grains per ear, length of ear and 1000-grain weight were significantly superior in the variety RAJ 4037 followed by HI 8682 and the all the yield attributes were lower in variety HP4080.

Each increased level of nitrogen from 0 kg ha^{-1} to 180 kg ha^{-1} has significantly increased all yield attributes compared to the preceding lower dose. Increased number of ears per sq. m with higher doses of nitrogen might be due to stimulatory effect of N on tillering through cytokinin synthesis resulting in more number of tillers. More accumulation of photosynthates in ears might have increased the length of spike. Higher doses of nitrogen resulted in higher accumulation of photosynthates and also increased grains per spike. These results were in conformity with findings of Sushila, R and Gajendra Giri (2000).

Grain Yield

The grain yield of wheat was significantly influenced by varieties and nitrogen levels. The variety RAJ 4037 recorded the highest grain yield (2930kg ha^{-1}) which was significantly superior to the other two varieties tested. Superiority of the variety RAJ 4037 in terms of yield can be attributed to its higher number of ears per sq.m, more grains per spike and 1000-grain weight compared to other two varieties. Difference in yields among varieties can also be attributed to their genetic potentiality to utilize and translocate photosynthates from source to sink. Superiority of variety RAJ 4037 in number of tillers and leaf area has resulted in higher dry matter accumulation which has contributed to more yield attributes and was reflected in higher yields. The results were in conformity with Parihar and Tiwari (2003), Behara and Pradhan (2007) and Sharma and Ashok Kumar (2009).

Increasing the nitrogen level from 0 kg ha^{-1} to 180 kg ha^{-1} significantly increased the grain yield from 1506.66 kg ha^{-1} to 3821.11 kg ha^{-1} . The increase in grain yield with enhanced N levels can be ascribed to better plant growth and dry matter production due to higher photosynthetic area. An increase in nitrogen supply increased all the yield attributing characters like ears per sq.m, number of grains per spike and 1000-grain weight which ultimately contributed to increase in yields. The results were in corroboration with findings of Sharma and Manohar (2002) that increase in yield was upto 120 kg N ha^{-1}. Similarly, Behara and Pradhan (2007) recorded increase in yield upto 90 kg N ha^{-1}. Similar findings were noted

by Dileep Kachroo and Ravinder Razdan (2006) and Parihar and Tiwari (2003).

The interaction effect studies of grain yield has shown that highest grain yield (4033.00 kg ha^{-1}) was obtained at 180 kg N ha^{-1} with the variety RAJ 4037 which was significantly higher than HI 8682 and HP 4080.

Straw Yield

The data on straw yield are in accordance with grain yield. Among the varieties RAJ 4037 recorded the significantly higher straw yield (3249.58 kg ha^{-1}) over HI 8682 (3107.50 kg ha^{-1}) and HP 4080 (3078.75 kg ha^{-1}). The varying levels of growth parameters in terms of number of tillers and leaf area among the varieties were responsible for the variation in straw yield. Similar differences in straw yields were noticed in the experiments conducted by Sharma and Ashok Kumar (2009) and Bastia and Rout (2001)

Increasing the nitrogen level from 0 kg ha^{-1} to 180 kg ha^{-1} has significantly increased the straw yield from 1882.77 kg ha^{-1} to 4123.88 kg ha^{-1}. Nitrogen is a component of porphyrins of chloroplasts and hence, increased nitrogen fertilization increased the growth and yield of crop due to increased photosynthates production. This resulted in better development in terms of plant height, number of tillers and leaf area which was reflected in higher straw yield. Similar results were also reported by Anil Kumar *et a*l. (2001) and Sushila and Gajendra Giri (2000).

The interaction studies has shown that RAJ 4037 recorded significantly higher straw yield (4253.33 kg ha^{-1}) followed by HI 8682 at 180kg ha^{-1} which is in turn significantly higher than HP 4080 at 180kg ha^{-1}.

Harvest Index

The variety RAJ 4037 recorded the higher harvest index (47.02) which was on par with the variety HI 8682 (46.90). The variation in harvest index might be due to difference among the three varieties in partitioning efficiency of photosynthates from source to sink. Similar difference among varieties was also reported by Behara and Pradhan (2007).

Increasing the nitrogen levels from 0 kg ha^{-1} to 180 kg ha^{-1} increased the harvest index significantly and application of 180 kg N ha^{-1} recorded significantly higher harvest index (48.08). The dry matter partitioning has been effective with increased level of nitrogen, thus, resulting in higher harvest index. These results were in conformity with the findings of Sushila and Gajendra Giri (2000).

The interaction studies have shown that all varieties at 180 kg N ha^{-1} and RAJ 4037 and HI 8682 at 60 kg N ha^{-1} gave significantly higher and on par harvest index compared to other interaction effects.

Economics

Among the varieties RAJ 4037 recorded the maximum net returns (Rs. 19337.00 ha^{-1}) and benefit-cost ratio (2.46) when compared to the other varieties tested.

Net returns and benefit-cost ratio increased with increase in nitrogen levels. Highest net returns (Rs. 28275.22 ha^{-1}) and benefit-cost ratio (3.05) were obtained with application of 180 kg N $ha^{-1,}$ where as 0 kg N ha^{-1} resulted in lowest net returns (Rs. 4844.33 ha^{-1}) and lowest benefit cost ratio (1.41).

On analyzing various interaction combinations of varieties and nitrogen levels for net returns gross returns and cost-benefit ratio it can be observed that highest net returns (Rs. 30459.66 ha^{-1}), gross returns (44366.66 ha^{-1}) and cost-benefit ratio (3.19) can be obtained from variety RAJ 4037 and 180 kg N ha^{-1} .

CONCLUSIONS

Among the three varieties, RAJ 4037 was found as the best in terms of yield for Southern Telangana zone.

All the three varieties gave response up to the maximum dose of 180 kg N ha^{-1}.

Maximum net returns and benefit-cost ratio were associated with variety RAJ 4037 at the dose of 180 kg N ha^{-1}.

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APPENDICES

Table 1: Plant Height (Cm) of Wheat as Influenced by Varieties and Nitrogen Levels

Treatment	10 DAS	30 DAS	60 DAS	90 DAS	At Harvest
Varieties					
HP 4080	12.50	24.66	67.83	73.58	76.16
RAJ 4037	13.33	23.66	63.25	69.91	72.50
HI 8682	12.50	24.41	67.25	72.41	75.20

S.Em ±	0.25	0.28	0.25	0.36	0.34
C.D (P=0.05)	0.74	N.S	0.75	1.08	1.02
Nitrogen Levels					
0 kg N ha^{-1}	10.55	17.88	49.44	59.22	63.22
60 kg N ha^{-1}	12.55	24.66	65.88	70.22	73.66
120 kg N ha^{-1}	13.55	26.22	71.33	75.66	77.77
180 kg N ha^{-1}	14.44	28.22	77.77	81.77	83.88
S.Em ±	0.29	0.32	0.29	0.42	0.40
C.D (P=0.05)	0.85	0.96	0.86	1.24	1.17
Interaction (V X N)	N.S	N.S	1.50	N.S	N.S

Table 2: Interaction Effect of Different Varieties and Nitrogen Levels on Plant Height (Cm) at 60 DAS

Treatments	**Varieties**			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen levels kg ha^{-1}				
0 kg N ha^{-1}	52.00	47.33	49.00	49.44
60 kg N ha^{-1}	68.66	63.66	65.33	65.88
120 kg N ha^{-1}	71.00	66.33	76.66	71.33
180 kg N ha^{-1}	79.66	75.66	78.00	77.77
Mean	67.83	63.25	67.25	---
S.Em ± 0.51 **C.D (P=0.05) 1.50**				

Table 3: Leaf Area Index of Wheat as Influenced by Varieties and Nitrogen Levels

Treatment	**10 DAS**	**30 DAS**	**60 DAS**	**90 DAS**
Varieties				
HP 4080	0.266	1.235	2.58	1.40
RAJ 4037	0.308	1.314	2.80	1.53
HI 8682	0.295	1.273	2.70	1.47
S.Em ±	0.005	0.007	0.02	0.02
C.D (P=0.05)	0.014	0.002	0.04	0.06
Nitrogen Levels				
0 kg N ha^{-1}	0.191	0.649	1.60	0.86
60 kg N ha^{-1}	0.239	1.159	2.53	1.45
120 kg N ha^{-1}	0.332	1.472	3.18	1.68
180 kg N ha^{-1}	0.396	1.817	3.46	1.87
S.Em ±	0.006	0.008	0.02	0.02
C.D (P=0.05)	0.017	0.023	0.05	0.06
Interaction (V X N)	N.S	N.S	N.S	N.S

Table 4: Dry Matter Accumulation (Kg Ha^{-1}) of Wheat as Influenced by Varieties and Nitrogen Levels

Treatment	**10 DAS**	**30 DAS**	**60 DAS**	**90 DAS**	**Harvest**
Varieties					
HP 4080	127.00	1235.83	2575.00	4457.50	5739.16
RAJ 4037	132.83	1309.58	2797.08	4735.00	6179.58
HI 8682	131.00	1259.58	2705.00	4536.25	5891.66
S.Em ±	0.74	8.85	18.27	15.76	26.72
C.D (P=0.05)	2.17	20.47	53.61	43.23	78.41
Nitrogen levels					
0 kg N ha^{-1}	104.88	735.55	1855.55	2638.88	3386.44
60 kg N ha^{-1}	125.55	1078.33	2433.33	4258.88	5390.55
120 kg N ha^{-1}	134.88	1440.00	3011.11	5210.55	7022.22
180 kg N ha^{-1}	155.77	1819.44	3469.44	6196.66	7945.00
S.Em ±	0.85	10.22	21.10	18.20	30.86

C.D (P=0.05)	2.51	29.98	61.88	53.39	90.55
Interaction (V X N)	N.S	N.S	N.S	N.S	156.82

Table 5: Interaction Effect of Different Varieties and Nitrogen Levels on Dry Matter Accumulation (Kg Ha^{-1}) at Harvest

Treatments	Varieties			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen Levels kg ha^{-1}				
0 kg N ha^{-1}	3146.66	3631.66	3390.00	3389.44
60 kg N ha^{-1}	5395.00	5533.33	5243.33	5390.55
120 kg N ha^{-1}	6773.33	7266.66	7026.66	7022.22
180 kg N ha^{-1}	7641.66	8286.66	7906.66	7945.00
Mean	5739.16	6179.58	5891.66	
S. Em ± 53.45 **C.D (P=0.05) 156.82**				

Table 6: Spike Length (cm), Grains per Ear, Number of Tillers per Sq. M, Number of Ears per sq. M and 1000-Grain Weight (g) of Wheat as Influenced by Varieties and Nitrogen Levels

Treatment	Spike Length	Grains per Ear	Number of Tillers per sq. m	Number of Ears per Sq. m	1000-Grain Weight
Varieties					
HP 4080	11.95	26.61	357.08	306.00	39.12
RAJ 4037	12.87	28.26	387.08	338.08	39.70
HI 8682	12.37	27.38	373.33	321.97	39.43
S.Em ±	0.12	0.09	1.58	2.24	0.03
C.D (P=0.05)	0.36	0.26	4.66	6.58	0.10
Nitrogen Level					
0 kg N ha^{-1}	10.11	20.44	350.00	253.22	37.90
60 kg N ha^{-1}	11.57	25.77	362.77	296.66	39.15
120 kg N ha^{-1}	13.20	30.73	382.22	349.77	40.04
180 kg N ha^{-1}	14.72	32.72	395.00	388.33	40.66
S.Em ±	0.14	0.10	1.83	2.59	0.04
C.D (P=0.05)	0.42	0.30	5.38	7.60	0.12
Interaction (V X N)	N.S	N.S	N.S	N.S	N.S

Table 7: Grain Yield (kg ha^{-1}), Straw Yield (kg ha^{-1}) and Harvest Index (%) of Wheat as Influenced by Varieties and Nitrogen Levels

Treatment	Grain Yield (kg ha^{-1})	Straw Yield (kg ha^{-1})	Harvest Index (HI)
Varieties			
HP 4080	2660.41	3078.75	45.74
RAJ 4037	2930.00	3249.58	47.02
HI 8682	2784.16	3107.50	46.90
S.Em ±	10.86	17.61	0.19
C.D (P=0.05)	31.85	51.65	0.57
Nitrogen Level			
0 kg N ha^{-1}	1506.66	1882.77	44.17
60 kg N ha^{-1}	2513.00	2876.66	46.44
120 kg N ha^{-1}	3324.44	3697.77	47.34
180 kg N ha^{-1}	3821.11	4123.88	48.08
S.Em ±	12.55	20.34	0.22
C.D (P=0.05)	36.81	59.64	0.66
Interaction (V X N)	63.77	103.36	1.14

Table 8: Effect of Different Wheat Varieties and Different Levels of Nitrogen on Net Returns (Rs ha^{-1}) and Benefit-Cost Ratio

Treatment	Total Cost	Gross Returns	Net Returns	Benefit-Cost Ratio
Varieties				
HP 4080	12600.66	29264.58	16671.58	2.28
RAJ 4037	12898.33	32230.00	19337.00	2.46
HI 8682	12743.66	30625.83	17882.83	2.36
Nitrogen level				
0 kg N ha^{-1}	11733.55	16573.33	4844.33	1.41
60 kg N ha^{-1}	12409.56	27652.77	15247.77	2.22
120 kg N ha^{-1}	13085.55	36568.88	23487.88	2.79
180 kg N ha^{-1}	13761.55	42032.22	28275.22	3.05

Table 9: Interaction Effect of Different Varieties and Nitrogen Levels on Grain Yield (kg ha^{-1})

Treatments	Varieties			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen levels kg ha^{-1}				
0 kg N ha^{-1}	1400.00	1613.33	1506.66	1506.66
60 kg N ha^{-1}	2388.33	2646.66	2506.66	2513.88
120 kg N ha^{-1}	3213.33	3426.66	3333.33	3324.44
180 kg N ha^{-1}	3640.00	4033.33	3790.00	3821.11
Mean	2660.41	2930.00	2784.16	
S.Em ± 21.73 **C.D (P=0.05) 63.77**				

Table 10: Interaction Effect of Different Varieties and Nitrogen Levels on Straw Yield (Kg Ha^{-1})

Treatments	Varieties			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen levels kg ha^{-1}				
0 kg N ha^{-1}	1746.66	2018.33	1883.33	1882.77
60 kg N ha^{-1}	3006.66	2886.66	2736.66	2876.66
120 kg N ha^{-1}	3560.00	3840.00	3693.33	3697.77
180 kg N ha^{-1}	4001.66	4253.33	4116.66	4123.88
Mean	3078.75	3249.58	3107.50	
S.Em ± 35.23 **C.D (P=0.05) S103.36**				

Table 11: Interaction Effect of Different Varieties and Nitrogen Levels on Harvest Index

Treatments	Varieties			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen levels kg ha^{-1}				
0 kg N ha^{-1}	43.64	44.42	44.44	44.17
60 kg N ha^{-1}	44.28	47.83	47.80	46.64
120 kg N ha^{-1}	47.44	47.15	47.44	47.34
180 kg N ha^{-1}	47.63	48.67	47.93	48.08
Mean	45.74	47.02	46.90	
S.Em ± 0.39 **C.D (P=0.05) 1.14**				

Table 12: Effect of Different Wheat Varieties and Different Levels of Nitrogen on Net Returns (Rs Ha^{-1}) and Benefit-Cost Ratio

Treatment	Total Cost	Gross Returns	Net Returns	Benefit-Cost Ratio
Varieties				
HP 4080	12600.66	29264.58	16671.58	2.28
RAJ 4037	12898.33	32230.00	19337.00	2.46
HI 8682	12743.66	30625.83	17882.83	2.36
Nitrogen Level				
0 kg N ha^{-1}	11733.55	16573.33	4844.33	1.41
60 kg N ha^{-1}	12409.56	27652.77	15247.77	2.22
120 kg N ha^{-1}	13085.55	36568.88	23487.88	2.79
180 kg N ha^{-1}	13761.55	42032.22	28275.22	3.05

Table 13: Interaction Effect of Different Wheat Varieties and Nitrogen Levels on Gross Returns (Rs Ha^{-1})

Treatments	Varieties			
	HP 4080	RAJ 4037	HI 8682	**Mean**
Nitrogen levels kg ha^{-1}				
0 kg N ha^{-1}	15400.00	17746.66	16573.33	16573.33
60 kg N ha^{-1}	26271.66	29113.33	27573.33	27652.77
120 kg N ha^{-1}	35346.66	37693.33	36666.66	36568.88
180 kg N ha^{-1}	40040.00	44366.66	41690.00	42031.22
Mean	29264.58	32230.00	30625.83	
S.Em ± 239.11 **C.D (P=0.05) 701.49**				